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NEOTROPICAL MONOGENEA. 6. FIVE NEW SPECIES OF *DIPLECTANUM* (DIPLECTANIDAE) FROM FRESHWATER TELEOSTS, *PLAGIOSCION* SPP. (SCIAENIDAE), IN BRAZIL

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Abstract.—Five new diplectanid monogenes are described from the gills of *Plagioscion squamosissimus* (Heckel) and *Plagioscion* sp. (Perciformes, Sciaenidae) from Janauaća Lake, Manaus, Amazonas, Brazil, as follows: *Diplectanum decorum* n. sp., *D. gymnopeus* n. sp., and *D. piscinarius* n. sp. from *P. squamosissimus*; *D. hilum* n. sp. from *Plagioscion* sp.; and *D. pescadae* n. sp. from *P. squamosissimus* and *Plagioscion* sp.

Members of *Diplectanum* Diesing, 1858 (Diplectanidae), are predominantly gill parasites of marine perciform fishes of the families Serranidae, Sciaenidae, Polynemidae, Toxodidae, Percichthyidae, Sparidae, Sillanginidae, Centropomidae, and Theraponidae. While some *Diplectanum* species have been recorded from freshwater hosts, all freshwater forms are reported from perciform fishes with relatively recent marine origins.

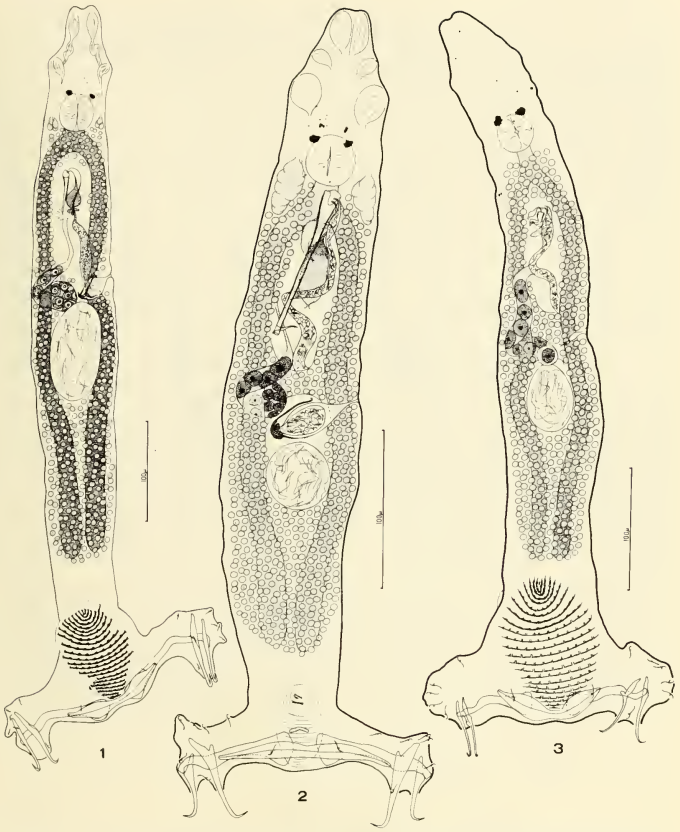
The host genus *Plagioscion* Gill consists of freshwater sciaenids inhabiting the larger rivers of South America; these fishes occasionally descend to marine waters along the coast (Jordan and Evermann 1896–1900). *Plagioscion squamosissimus* (Heckel) is the common sciaenid distributed throughout the Amazon Basin. *Plagioscion* sp. was described as a new species in an unpublished thesis by Soares (1978) at the Instituto Nacional de Pesquisas da Amazônia. The present study includes the description of five new species of *Diplectanum* from the gills of these hosts, three of which were found only on *P. squamosissimus,* and one of which occurred only on *Plagioscion* sp. One new species was collected from both hosts.

Hosts were collected from Janauaća Lake, near Manaus, Amazonas, Brazil on several occasions during 1978–80. The gills of each fish were removed and placed in finger bowls containing a 1:4000 formalin solution to kill and relax the helminth specimens. Monogenes were collected and prepared for study as described previously by Thatcher and Kritsky (1983). Measurements were made according to the procedures outlined by Mizelle and Klucka (1953); averages are followed by ranges in parentheses; all are in micrometers. The dimension of the ovary is the greatest diameter. Illustrations were prepared with the aid of a camera lucida or microprojector. Type-specimens were deposited in the collections of the Instituto Nacional de Pesquisas da Amazônia (INPA), the U.S. National Museum Helminthological Collection (USNM), and the University of Nebraska State Museum (UNSM) as indicated below.

Diplectanum decorum, new species
Figs. 1, 18–24

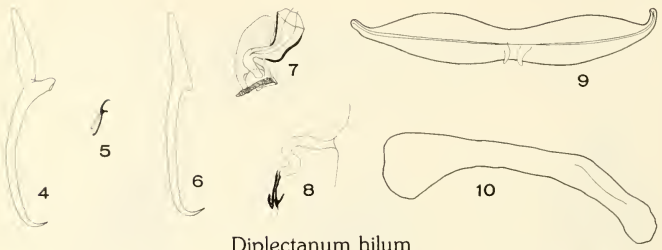
Host.—Gills of pescada, *Plagioscion squamosissimus* (Heckel) Sciaenidae.

Type-specimens.—INPA (holotype, PA-245-1; paratypes, PA-245-2 to PA-245-3), UNSM (paratypes, 21635), USNM Helm. coll. (paratypes, 77917).

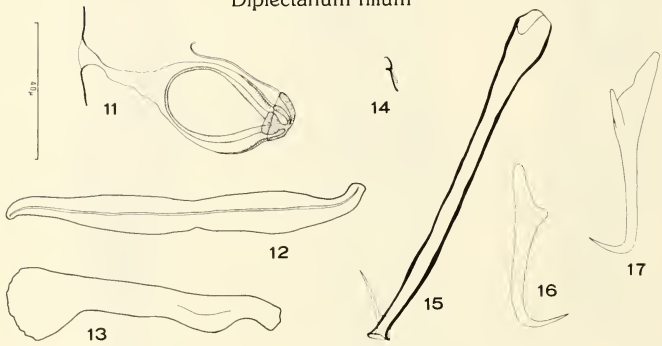


Figs. 1–3. Composite drawings of *Diplectanum* species (ventral). 1, *Diplectanum decorum*; 2, *Diplectanum gymnopeus*; 3, *Diplectanum hilum*.

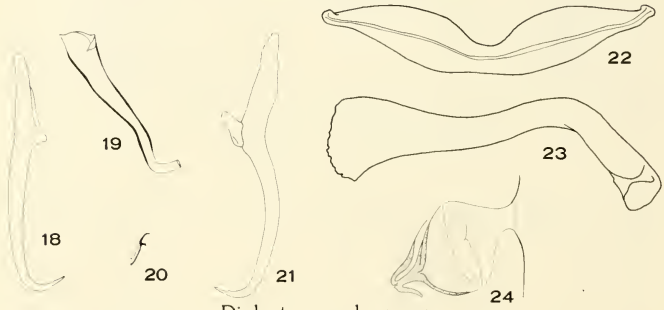
Description (based on 8 specimens).—Diplectanidae, Diplectaninae. Body 776 (701–860) long, slender, fusiform; greatest width 94 (86–105) near level of testis. Tegument smooth. Two terminal, 2 bilateral cephalic lobes moderately developed; head organs conspicuous, lying in cephalic lobes and adjacent cephalic area; small group of unicellular cephalic glands lying posterolateral to pharynx. Usually 2 eyes; anterior pair, when present, poorly developed or represented by scattered granules, members closer together than those of posterior pair; eyespot granules subovate, variable in size; accessory granules present in cephalic area. Mouth



Diplectanum hilum



Diplectanum gymnopeus



Diplectanum decorum

Figs. 4–24. Sclerotized parts of *Diplectanum* species. Figs. 4–10, *Diplectanum hilum*: 4, Ventral anchor; 5, Hook; 6, Dorsal anchor; 7, Copulatory complex; 8, Vagina; 9, Ventral bar; 10, Dorsal bar. Figs. 11–17, *Diplectanum gymnopeus*: 11, Vagina (dorsal); 12, Ventral bar; 13, Dorsal bar; 14, Hook; 15, Copulatory complex; 16, Dorsal anchor; 17, Ventral anchor. Figs. 18–24, *Diplectanum decorum*: 18, Dorsal anchor; 19, Copulatory complex; 20, Hook; 21, Ventral anchor; 22, Ventral bar; 23, Dorsal bar; 24, Vagina.

subterminal, ventral; pharynx subspherical, 37 (34–39) in diameter; esophagus short to absent; crura blind posteriorly.

Peduncle broad, elongate; haptor 248 (221–290) wide, 95 (89–101) long, with two conspicuous bilateral lobes. Squamodiscs ovate, overlying distal peduncle and medial portion of haptor; ventral squamodisc 91 long, 73–74 wide, with 23–24 curved rows of rods; dorsal squamodisc 103–104 long, 72–73 wide, with 24 curved rows of rods. Squamodisc rods sclerotized, easily lost in preserved specimens; marginal rods with pointed lateral and enlarged medial terminations; medial rods with anterior projections on each enlarged termination; rods of posteriormost rows scale-like. Anchors dissimilar; ventral anchor 78 (75–82) long, with large elongate deep root, knob-like superficial root, curved shaft, short point; dorsal anchor 69 (66–70) long, with tapered deep root, incipient superficial root, straight shaft, short point. Ventral bar 96 (88–109) long, with tapered ends, constricted medial portion, ventral groove; dorsal bar 105 (95–127) long, with spathulate medial end. Six pairs of hooks lying on lateral haptoral lobes, one pair near tips of ventral bar; hooks similar, each 11–12 long, with curved shank, perpendicular thumb, delicate shaft and point. FH loop ⅞ shank length.

Cirrus 53 (50–55) long, an elongate, tapered tube with sigmoid or straight distal end; accessory piece absent. Gonads slightly overlapping. Testis postovarian, subovate, 53 (45–60) wide, 87 (83–90) long; vas deferens conspicuous anteriorly, lying sinistral to midline; seminal vesicle a conspicuous dilation of vas deferens; prostatic reservoir pyriform. Ovary pyriform, looping right intestinal crus; greatest diameter 41. Oviduct, ootype not observed; uterus delicate, extending along midline; genital pore midventral; vagina sinistral, comprising a distal unsclerotized pouch with proximal sclerotized cup-like sheath; vitellaria coextensive with intestine.

Remarks.—*Diplectanum decorum* resembles several species of the genus parasitizing sciaenid fishes (i.e., *D. sciaenae* van Beneden and Hesse, 1863; *D. bocqueti* Oliver, 1980; *D. dollfusi* Oliver, 1980; *D. chabaudi* Oliver, 1980; *D. grassei* Oliver, 1974; *D. gymnopeus* and others) by possessing a simple tubular cirrus which is not associated with an accessory piece. All of these species can be distinguished from *D. decorus* by the comparative morphology of the vagina.

Etymology.—The specific name is from Latin *decoris* = elegant.

Diplectanum gymnopeus, new species
Figs. 2, 11–17

Host.—Gills of pescada, *Plagioscion squamosissimus* (Heckel), Sciaenidae.

Type specimens.—INPA (holotype, PA-243-1); UNSM (paratype, 21640); USNM Helm. Coll. (paratypes, 77921).

Description (based on 4 specimens).—Diplectanidae, Diplectaninae. Body robust, fusiform, 619 (553–666) long; greatest width 90 (81–98) near level of gonads. Tegument smooth. Cephalic lobes incipient, 2 terminal, 2 bilateral; head organs large, 2 pairs lying in cephalic lobes and adjacent cephalic area, one pair in cephalic region between lobes; cephalic glands comprising 2 large distinct bilateral groups of unicellular glands posterolateral to pharynx. Eyes usually 4; members of anterior pair poorly developed or absent, closer together than those of posterior pair; eyespot granules large, subovate; few accessory granules in cephalic area. Mouth

subterminal, ventral; pharynx spherical, 33 (28–37) in diameter; esophagus short to absent; crura blind posteriorly.

Peduncle broad; haptor 199 (179–223) wide, 82 (79–84) long, with 2 bilateral lobes. Squamodiscs reduced; all available specimens having lost most sclerotized rods. Medial rods with enlarged terminations; small bar-like structure probably associated with haptoral musculature present beneath ventral squamodisc. Anchors dissimilar; ventral anchor 61 (59–63) long, with lateral superficial root, large deep root, straight shaft, short point; dorsal anchor 51 (44–55) long, with elongate deep root, incipient superficial root, straight shaft, short point. Ventral bar 108 (106–110) long, slender, elongate, with tapered ends, inconspicuous medial constriction, ventral groove; dorsal bar 75 (71–80) long, robust, with spathulate medial end, subterminal lateral inflation. Six pairs of hooks on lateral haptoral lobes, one pair near medial terminations of dorsal bars; hooks similar, each 11–12 long, with curved shank, erect thumb, delicate point and shaft. FH loop ¾ shank length.

Cirrus 104 (94–108) long, an elongate sclerotized tube with terminal reflexed spike; accessory piece absent. Gonads separated by large vagina. Testis postovarian, spherical to subovate, 43 (38–49) wide, 44 (39–49) long; vas deferens conspicuous anteriorly, with loop near base of prostatic reservoirs; seminal vesicle an indistinct dilation of terminal vas deferens. Two prostatic reservoirs; anterior reservoir lunate, simple; posterior reservoir elongate ovate, usually with two areas of density. Ovary pyriform, lying to right of midline, looping right intestinal crus; greatest diameter 28 (27–30). Oviduct, ootype not observed; uterus delicate, extending anteriorly to right of midline; genital pore midventral; vagina sinistral, comprising a large terminal pouch containing sclerotized seminal receptacle filled with sperm; vitellaria throughout trunk except absent in areas of reproductive structures.

Remarks.—This species resembles *D. aequans* (Wagener, 1857) Diesing, 1858, by the comparative morphology of the haptoral armament and copulatory complex. In *D. gymnopeus,* the vagina encloses an obvious seminal receptacle, whereas the seminal receptacle in *D. aequans* occurs as a simple dilation of the duct of the vagina. The species also can be separated by subtle differences in the morphology of the anchors and bars (compare Figs. 2, 11–17 *nobis* and Figs. 2–5 in Oliver, 1968).

Etymology.—The species name is from Greek *gymno/o* = naked + *peos* = penis, and refers to the absence of an accessory piece in the copulatory complex.

Diplectanum hilum, new species
Figs. 3–10

Host.—Gills of pescada, *Plagioscion* sp., Sciaenidae.

Type specimens.—INPA (holotype, PA-246-1; paratypes, PA-246-2 to PA-246-4); UNSM (paratypes, 21636); USNM Helm. Coll. (paratypes, 77916).

Description (based on 12 specimens).—Diplectanidae, Diplectaninae. Body robust, tapered anteriorly; length 591 (548–706), greatest width 87 (65–112) usually at level of testis. Tegument smooth. Cephalic margin with 2 terminal, 2 bilateral cephalic lobes incipient; head organs, cephalic glands weakly developed. Eyes 2, large; eye granules small, elongate ovate; accessory granules present. Mouth subterminal, ventral; pharynx subspherical, 27 (23–32) in diameter; intestinal crura blind posteriorly.

Peduncle broad; haptor 179 (148–207) wide, 86 (72–101) long, with 2 large bilateral lobes. Squamodiscs ovate, with 18–23 rows of sclerotized rods; ventral disc 94 (77–110) long, 69 (59–74) wide; dorsal disc 94 (87–100) long, 69 (57–78) wide. Three types of squamodisc rods; marginal rods with tapered lateral and enlarged medial end, medial rods with bilateral anterior projections; posterior rods scale-like. Rods become more delicate posteriorly. Anchors delicate, dissimilar; ventral anchor 66 (58–71) long, with elongate deep root, depressed superficial root, curved shaft, short point; dorsal anchor 61 (58–65) long, with long tapered deep root, erect superficial root, straight shaft, short point. Ventral bar 83 (73–90) long, with tapered ends, constricted midregion, ventral longitudinal groove, 2 posteromedial processes; dorsal bar 78 (68–90) long, rod-shaped with spathulate medial termination. Six pairs of hooks lying on lateral haptor lobes, 7th pair usually located near terminations of ventral bar; hooks similar, each 11–12 long, with curved shank, erect thumb, delicate curved shaft and point; FH loop ⅞ shank length.

Cirrus 22 (18–25) long, a contorted tapered tube, usually sigmoid, acessory piece 21 (18–22) long, slightly sclerotized, with flat base, terminal aperture functioning as cirrus guide. Gonads tandem. Testis postovarian, ovate, 43 (40–45) wide, 51 (46–54) long; vas deferens with conspicuous loop posterior to level of cirrus; seminal vesicle an inconspicuous dilation of vas deferens; prostatic reservoirs comprising 2 indistinct vesicles lying near cirrus base. Ovary elongate, approximate equal diameter, 20 (18–23), throughout. Oviduct, ootype, uterus not observed; genital pore ventral, immediately posterior to cirrus; vagina sinistral, comprising a distal unsclerotized chamber, proximal sclerotized valve; vitellaria coextensive with intestinal crura.

Remarks.—This species is separated from its sibling, *D. pescadae,* by the comparative morphology of the vagina, haptoral armament, and copulatory complex.

Etymology.—The specific name is from Latin *hilum* = a little thing.

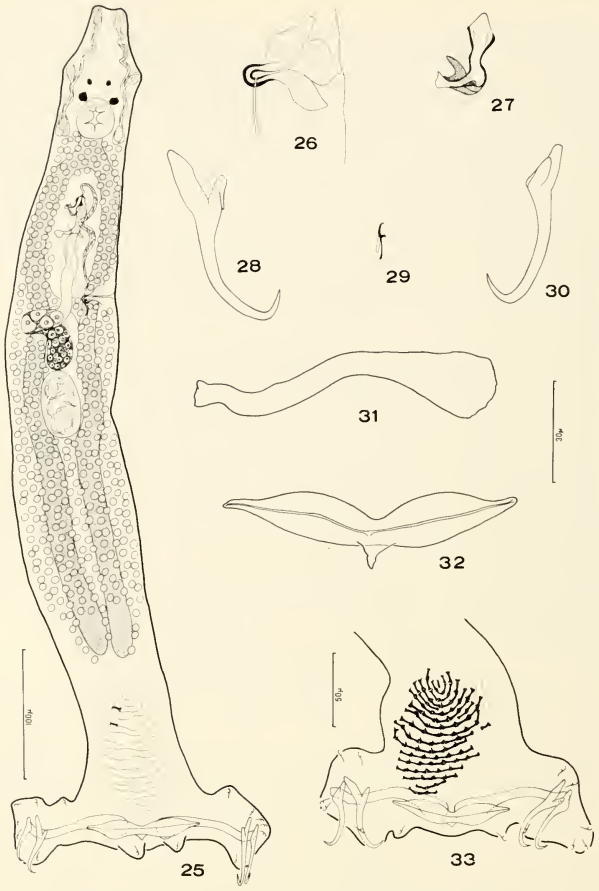
Diplectanum pescadae, new species
Figs. 25–33

Host.—Gills of pescada, *Plagioscion squamosissimus* (Heckel) (type host) and *Plagioscion* sp., Sciaenidae.

Type specimens.—INPA holotype, PA-242-1; paratypes, PA-242-2 to PA-242-12); UNSM (paratypes, 21637); USNM Helm. Coll. (paratypes, 77918, 77919).

Description (based on 52 specimens, 20 measured).—Diplectanidae, Diplectaninae. Body slender, fusiform; length 638 (502–837) greatest width 93 (74–106) usually at level of testis. Tegument smooth. Two terminal, 2 bilateral cephalic lobes poorly developed; head organs small, lying in cephalic lobes and adjacent cephalic area; cephalic glands inconspicuous, comprising 2 groups of unicellular glands posterolateral to pharynx. Eyes 4; members of anterior pair smaller, closer together than members of posterior pair; eye granules variable to ovate; accessory granules usually present in cephalic area. Mouth subterminal, ventral; pharynx subspherical, 32 (25–37) in diameter; intestinal crura blind posteriorly.

Peduncle broad, elongate; haptor 188 (160–237) wide, 78 (69–88) long, with 2 bilateral lobes. Squamodiscs ovate, lying in peduncle and anteromedial haptor; ventral squamodisc 105 (95–117) long, 77 (74–82) wide, with 16–20 rows of sclerotized rods; dorsal disc 102 (93–115) long, 75 (64–82) wide, with 19–22 rows



Figs. 25–33. *Diplectanum pescadae*: 25, Composite illustration of whole mount (ventral); 26, Vagina; 27, Copulatory complex; 28, Ventral anchor; 29, Hook; 30, Dorsal anchor; 31, Dorsal bar; 32, Ventral bar; 33, Haptor (ventral).

of rods. Three types of rods; lateral rods with pointed lateral and enlarged medial terminations; medial rods with enlarged ends possessing short anterior projections; rods of posterior rows scale-like. Anchors dissimilar; ventral anchor 53 (47–57) long, with well developed roots, bent shaft, short point; dorsal anchor 46 (43–50)

long, lacking superficial root, with evenly curved shaft, short point. Ventral bar 78 (70–84) long with tapered ends, medial construction, posteromedial projection, ventral longitudinal groove; dorsal bar 77 (67–83) long, with spathulate medial termination. Six pairs of hooks located on lateral haptoral lobes, one pair on small lobes on posterior haptoral margin; hooks similar, each 11–12 long, with slightly curved shank, perpendicular thumb, delicate shaft and point; FH loop 4/5 shank length.

Cirrus 21 (17–24) long, shaped as inverted Greek letter gamma (Γ), with varying diameter along length, distal sheath present; accessory piece absent. Gonads tandem. Testis postovarian, ovate, 41 (33–54) wide, 63 (53–78) long; vas deferens delicate, with loop posterior to cirrus; seminal vesicle absent or represented by inconspicuous dilation of vas deferens; prostatic reservoir with bilateral basal ducts. Ovary pyriform, anterior end looping right crus, greatest diameter 25 (24–27). Oviduct, ootype not observed; uterus delicate, extending anteriorly along midline; genital pore midventral, immediately posterior to cirrus; vagina sinistral, comprising a distal unsclerotized cavity, proximal sclerotized sheath, and fine tube; vitellaria coextensive with intestine.

Remarks.—The closest relative of this species is *Diplectanum hilum.* They are easily distinguished by the comparative morphology of the vagina and cirrus.

Etymology.—The specific name is derived from the local name of the fish host.

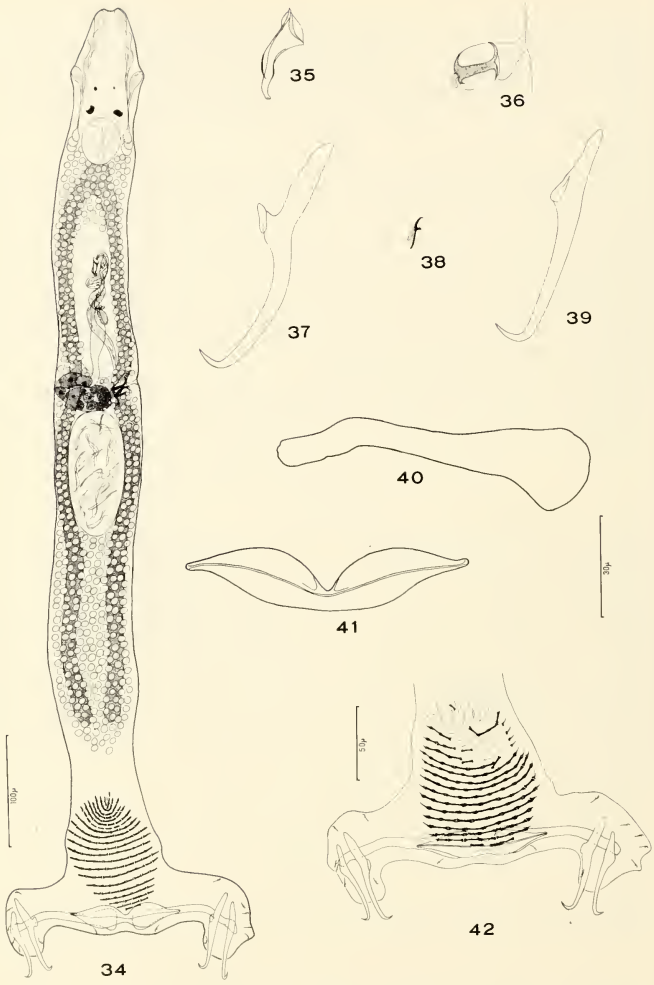
Diplectanum piscinarius, new species
Figs. 34–42

Host.—Gills of pescada, *Plagioscion squamosissimus* (Heckel), Sciaenidae.

Type specimens.—INPA (holotype, PA-244-1; paratypes, PA-244-2 to PA-244-5); UNSM (paratypes, 21639); USNM Helm. Coll. (paratypes, 77920).

Description (based on 13 specimens).—Diplectanidae, Diplectaninae. Body elongate, rod-shaped; length 728 (537–869), greatest width 86 (69–98) near level of testis. Tegument smooth. Cephalic lobes poorly developed, 2 terminal, 2 bilateral; heads organs well developed, one lying in each cephalic lobe and adjacent cephalic area; cephalic glands comprising 2 indistinct bilateral groups of unicellular glands posterolateral to pharynx. Eyes 4, members of anterior pair smaller, closer together than those of posterior pair; eyespot granules subspherical to irregular, small; accessory granules rare. Mouth ventral, subterminal; pharynx spherical, 35 (29–39) in diameter; crura blind posteriorly.

Peduncle broad, elongate; haptor 206 (191–228) wide, 86 (81–92) long, with two bilateral lobes. Squamodiscs subovate with approximately 19–21 rows of sclerotized rods; ventral disc 106 (103–108) long, 80–81 wide; dorsal disc 97–98 long, 80–81 wide. Two types of rods; marginal rods with pointed lateral and enlarged medial ends; medial rods with enlarged terminations. Anchors dissimilar; ventral anchor 71 (66–77) long, with elongate deep root, knob-like superficial root, bent shaft, short point; dorsal anchor 64 (59–68) long, with elongate deep root, straight shaft and point, lacking superficial root. Ventral bar 84 (77–91) long with tapered ends, deep medial indentation of anterior margin, ventral groove; dorsal bar 88 (76–97) long, with spathulate medial termination. Six hook pairs lying in lateral haptoral lobes, 7th pair posterior to ventral bar; hooks similar, each 10–11 long, with delicate shank, perpendicular thumb, tapered shaft and point; FH loop 3/4 shank length.



Figs. 34–42. *Diplectanum piscinarius*: 34, Composite drawing of whole mount (ventral); 35, Copulatory complex; 36, Vagina; 37, Ventral anchor; 38, Hook; 39, Dorsal anchor; 40, Dorsal bar; 41, Ventral bar; 42, Haptor (ventral).

Cirrus 23 (20–26) long, funnel-shaped with delicate lateral flange; accessory piece absent. Gonads tandem. Testis postovarian, intercecal, ovate, 42 (35–47) wide, 87 (61–115) long; vas deferens conspicuous, with 2 loops posterior to cirrus; seminal vesicle absent or represented by inconspicuous dilation of vas deferens; prostatic reservoir an elongate structure with 2 bulbous portions. Ovary pyriform, loops right crus; greatest diameter 33 (31–34). Ootype not observed; uterus delicate, extending anteriorly along midline; genital pore midventral; vagina sinistral, comprising a distal unsclerotized pouch, proximal sclerotized dumbbell-shaped valve; vitellaria throughout trunk except absent in regions of reproductive structures.

Remarks.—*Diplectanum piscinarius* most closely resembles *D. cayennensis* Euzet and Durette-Desset, 1973, which was described from *Plagioscion auratus* (Castelnau) from the coast of Guyana. These species are differentiated by the comparative morphology of the dorsal anchors, which in *D. cayennensis* possess a subterminal projection near the union of the shaft and point (compare Figs. 34–42 *nobis* and Figs. 1–5 in Euzet and Durett-Desset, 1973).

Etymology.—The species name is from Latin *piscinarius* = fish loving.

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